APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/851,858	05/09/2001	Sridhar Gollamudi	2	3687

			EXAMINER
46290	7590	04/21/2005	PERILLA, JASON M

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HOUSTON, TX 77042

ART UNIT	PAPER NUMBER
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DATE MAILED: 04/21/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _16 November 2001_.

2a)☒ This action is **FINAL**.   2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-36_ is/are pending in the application.

     4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-10,14,15,20,29-31 and 34-36_ is/are rejected.

7)☒ Claim(s) _11-13,16-19,21-28,32 and 33_ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _27 August 2001_ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

     a)☐ All b)☐ Some * c)☐ None of:

       1.☐ Certified copies of the priority documents have been received.

       2.☐ Certified copies of the priority documents have been received in Application No. _____.

       3.☐ Copies of the certified copies of the priority documents have been received in this National Stage
application from the International Bureau (PCT Rule 17.2(a)).

     * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
    Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application (PTO-152)

6)☐ Other: _____.

DETAILED ACTION

1.   Claims 1-36 are pending in the instant application.

Response to Arguments/Amendments

2.   In view of the remarks filed November 16, 2004 the objections to the drawings have been withdrawn.

3.   In view of the amendments to the claims, the claim objections of the first office action dated August 11, 2004 have been withdrawn.

4.   In view of the amendments to the claims and the arguments presented in the response of November 16, 2004, the rejections of claims 6, 11-13, 17-19, and 23-25 under 35 U.S.C. § 112 first and second paragraphs have been withdrawn.

5.   Applicant's arguments, see remarks, filed November 16, 2004, with respect to the prior art rejections set forth in the first office action have been fully considered and are persuasive in view of the amendments to the claims. The prior art rejections of claims 1-5, 7-10, 14, 15, 20, 21, and 26 have been withdrawn.

However, new prior art rejections are set forth below.

Claim Objections

6.   Claims 4-25 and 29-36 are objected to because of the following informalities:

Regarding claim 4, in line 5, the "H" of $\Phi = L^H L$ is not clearly defined in the claim. A particular description of the function or notation of "H" should be included in the claim.

Regarding claim 8, in line 9, "beamforming of the stream" should be replaced by –beamforming applied to the stream—to make the claim language more definite, and, in lines 5 and 9, "stream of information" should be replaced by –stream of incoming

information--. Further, the claim is objected to for being indefinite because one is unable to determine an order of steps in the method. One is unable to determine if the incoming information stream is modified by the beamforming weight parameter or the code correlation parameter first because no order of events is implied by the claim language.

Regarding claim 18, in line 1, "the delay" should be replaced by --the fixed time delay--, in lines 1-2, "the difference between the time" should be replaced by --a difference between a time--, and, in line 3, "the time" should be replaced by --a time--.

Regarding claim 19, in line 1, "the delay" is replaced by --the fixed time delay--, and, in line 2, "the ratio" is replaced by --a ratio--.

Regarding claim 21, in lines 9 and 10, it is suggested by the Examiner that the second signal and the first signal are added rather than subtracted. The minus sign between the first and second signals in Table 1, Antenna 1 & Time 1 index, (page 8) is caused by the negative sign of the data $-s^*_2$ rather than by a "subtract" function as claimed.

Regarding claim 22, the claim is objected to for the same reasons as applied to claim 21 above.

Regarding claim 23, the claim is objected to for the same reasons as applied to claim 21 above.

Regarding claim 24, in line 1, "wherein the component signals" should be replaced by --wherein the at least two component signals--.

Regarding claim 29, antennae in line 1 and antenna in line 6 should be spelled

consistently.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7.   Claims 8, 9, 14, and 15 are rejected under 35 U.S.C. 102(e) as being anticipated

by Harrison (US. 6154485 – previously cited).

Regarding claim 8, Harrison discloses by figure 1 a method of generating signals

for transmitting from at least two antennae of a wireless communications system

(abstract) comprising the steps of: feeding a stream of incoming information symbols

(TCH; 58) to an encoder (60, 76); feeding a signal representative of a beamforming

weight parameter (W0, W1) to the encoder to modify the stream of information symbols;

determining a code correlation parameter (α; col. 7, lines 50-53) based on an auto-

correlation of a channel estimate or in proportion to the degradation in quality of

feedback data (col. 8, lines 32-35); feeding the code correlation parameter (fig. 5; α) to

the encoder to control the proportion of orthogonal coding relative to beamforming of the

stream of information symbols that are to be transmitted (fig. 5; col. 8, lines 5-35) ; and

feeding the stream of information symbols modified by the code correlation parameter to

at least two antennae for transmission (116, 118). The spreading codes W0 and W1

(col. 3, lines 12-18) are considered beamforming weight parameters because they

differentiate or weight and modify the information signals. The adaptive array processor

(76) of figure 1, which is considered to be part of the signal encoder, may be

implemented by the matrix multiplication of figure 5 (col. 5, lines 10-18). The encoder

embodiment of figure 5 must necessarily be "fed" the code correlation parameter α

because it is used as input to the multipliers 172 and 176. Further, as broadly as

claimed, the code correlation parameter α is based upon the estimation or auto-

correlation of the channel quality taken as feedback as disclosed by Harrison (col. 8,

lines 32-35). That is, Harrison discloses that the transmitter may adapt (beamforming

vs. orthogonal transmit diversity) the transmission according to the code correlation

parameter generated in response to the feedback data which is supplied by the channel

measurement and feedback processor (fig. 1, ref. 149; col. 4, lines 28-39).

Regarding claim 9, Harrison discloses the limitations of claim 8 as applied above.

Further, Harrison discloses that the code correlation parameter determines the

correlation of the encoded signals to the different antennae (fig. 5). The multiplication

blocks 172 and 176 are responsive to the code correlation parameter α according to the

evaluation $(1 - \alpha^2)^{1/2}$. Therefore, the encoded signals are thereby responsive to the

different antennae (connected to 94 and 96) according to the code correlation

parameter α.

Regarding claim 14, Harrison discloses the limitations of claim 9 as applied

above. Further, Harrison discloses a duplex communication system having a forward

and reverse link (fig. 1; col. 4, lines 28-38) and that the code correlation parameter is

determined from signals received on the reverse link (col. 4, line 64 – col. 5, line 17).

Harrison discloses that adaptive array weights (90 and 92) are computed according to

the feedback (col. 4, lines 35-40). Furthermore, in the adaptive array encoder

embodiment of figure 5, the code correlation parameter α (col. 7, lines 47-60) is further

responsive to the feedback of communications method (col. 8, lines 5-35, *lines 32-35*).

Regarding claim 15, Harrison discloses the limitations of claim 14 as applied

above. Further, Harrison discloses determining an adaptive array weight or a channel

correlation coefficient (fig. 1, refs. V0 and V1; col. 4, lines 29-39) from signals received

on the reverse link.

Claim Rejections - 35 USC § 103

8.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

9.   Claims 1, 2, and 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable

over Harrison.

Regarding claim 1, Harrison discloses a method of encoding information symbols

for multiple antennae transmission (abstract) comprising the steps of: generating a code

matrix B_0 or parallel traffic channels (fig. 1, refs. 64, and 66; col. 3, lines 8-12);

generating a transformation matrix L (fig. 5; col. 7, lines 40-60) based on an auto-

correlation of a channel estimate (col. 4, lines 28-38); and combining the code matrix B_0

with the transformation matrix L (α, V1, V0) to obtain a result B for controlling the

amount of beamforming relative to the amount of orthogonal coding in signals

transmitted from the multiple antennae (fig. 5; col. 8, lines 5-35). Figure 1 shows the

code matrix channels 64 and 66 which are output as 72 and 74. Figure 5 represents

the realization of the combination of transformation matrix L by the code matrix (72 and

74). Although the transformation matrix is not explicitly disclosed in matrix form, it is

obvious that the combination illustrated in figure 5 depicts the transformation matrix

comprising elements $(1-\alpha^2)^{1/2}$ combined with the code matrix. The term alpha (α) is

used to control the amount of beamforming relative the amount of orthogonal coding in

the output of the combination (col. 8, lines 5-35).

Regarding claim 2, Harrison discloses the limitations of claim 1 as applied above.

Further, as broadly as claimed, the transformation matrix L is a matrix such that the

conjugate transpose of L multiplied by L generates a correlation matrix Φ. Because no

limitations are implied for the value of the correlation matrix in the claims or the

specification, it is understood that the matrix L multiplied by the conjugate transpose of

the matrix L would sufficiently result in the correlation matrix as broadly as claimed.

Regarding claim 4, Harrison discloses the limitations of claim 4 as applied to

claims 1 and 2 above.

Regarding claim 5, Harrison discloses the limitations of claim 4 as applied above.

Further, Harrison discloses the desired correlation parameter α (equivalent to λ of the

instant application). Alpha is used to control the amount of beamforming relative the

amount of orthogonal coding in the output of the combination (col. 8, lines 5-35).

According to figure 5, the transformation matrix and hence the correlation matrix is

comprised of alpha.

Regarding claim 6, as defined by claim 4, line 5 ($\Phi = L^H L$), the transformation

matrix L is the matrix square root of the desired correlation matrix (i.e. inverse of Φ

$= L^H L$).

10.   Claims 3, 7, 20, 29, 30, 31, 35, and 36 are rejected under 35 U.S.C. 103(a) as

being unpatentable over Harrison in view of Alamouti et al (US 6185258 – previously

cited; hereafter "Alamouti").

Regarding claim 3, Harrison discloses the limitations of claim 1 as applied above.

Harrison does not explicitly disclose that the code matrix B_0 is orthogonal although

orthogonal transmit diversity is utilized (col. 1, lines 45-57; col. 8, lines 4-12). However,

Alamouti discloses the generation of an orthogonal code matrix for transmission of data

over two or more antennas (abstract). An orthogonal code matrix is disclosed in table 1

as the outputs of antenna 1 and 2 over the time periods t and t+T (col. 4, line 20).

Alamouti discloses that the use of orthogonal coding results in space, time and

frequency diversity (col. 2, lines 50-55). Therefore, it would have been obvious to one

having ordinary skill in the art at the time which the invention was made to utilize an

orthogonal code matrix as disclosed by Alamouti in the encoding method of Harrison

because it would allow for space, time and frequency diversity. Further, the use of an

orthogonal code matrix is obvious in view of Harrison alone because in the case that $\alpha =$

0, orthogonal transmit diversity mode is solely enabled (col. 8, lines 5-12).

Regarding claim 7, Harrison discloses the limitations of claim 7 as applied above.

Harrison does not explicitly disclose that the code matrix B_0 is generated by encoding

symbols of a serial data stream with orthogonal code to generate an orthogonal code

matrix B_0 although orthogonal transmit diversity is utilized (col. 1, lines 45-57; col. 8,

lines 4-12). However, Alamouti discloses the generation of an orthogonal code matrix

for transmission of data over two or more antennas (abstract). An orthogonal code

matrix is disclosed in table 1 as the outputs of antenna 1 and 2 over the time periods t

and t+T (col. 4, line 20). The matrix is generated by encoding the symbols s0 and s1 of

a serial data stream by an orthogonal code as shown in the result of table 1. Alamouti

discloses that the use of orthogonal coding results in space, time and frequency

diversity (col. 2, lines 50-55). Therefore, it would have been obvious to one having

ordinary skill in the art at the time which the invention was made to utilize an orthogonal

code to generate the code matrix B_0 as disclosed by Alamouti in the encoding method of

Harrison because it would allow for space, time and frequency diversity. Further, the

use of an orthogonal code matrix is obvious in view of Harrison alone because in the

case that $\alpha = 0$, orthogonal transmit diversity mode is solely enabled (col. 8, lines 5-12).

Regarding claim 20, Harrison discloses the limitations of claim 8 as applied

above. Harrison does not explicitly disclose that the stream of incoming signals is

orthogonal although orthogonal transmit diversity is utilized (col. 1, lines 45-57; col. 8,

lines 4-12). However, Alamouti teaches the generation of an orthogonal code matrix for

transmission of data over two or more antennas (abstract). An orthogonal code matrix

is disclosed in table 1 as the outputs of antenna 1 and 2 over the time periods t and t+T

(col. 4, line 20) which creates an output to the antennas which is a symbol and the

complex conjugate of the symbol (period t vs. t+T). Alamouti discloses that the use of

orthogonal coding results in space, time and frequency diversity (col. 2, lines 50-55).

Therefore, it would have been obvious to one having ordinary skill in the art at the time

which the invention was made to generate an orthogonal code matrix with orthogonal

symbols as the stream of incoming signals of Harrison as taught by Alamouti because it

would allow for space, time and frequency diversity. Further, the use of an orthogonal

code matrix is obvious in view of Harrison alone because in the case that $\alpha = 0$,

orthogonal transmit diversity mode is solely enabled (col. 8, lines 5-12). Thereby, in the

method of Harrison in view of Alamouti the symbol signal transmitted by each antenna

at each symbol time is the sum of one or more signals (fig. 5), each of which is

proportional to the product of one of the incoming symbols (72) and their complex

conjugates (74) with a number that is determined by lambda or alpha (α). With

orthogonal code as the input to the encoder embodiment (fig. 5) of Harrison, the symbol

output (94) would be a composition or product of one incoming signal (72) with their

complex conjugate (74) with a number that is determined by alpha (172 and 176; (1-

$\alpha^2)^{1/2}$).

Regarding claim 29, Harrison discloses a method of encoding information

symbols for multiple antennae transmission (abstract) comprising the steps of:

determining a plurality of codes (fig. 1. refs. 72 and 74); estimating at least one

autocorrelation (α; col. 7, lines 50-53) of at least one channel (col. 8, lines 32-35); and

determining an amount of beamforming relative to an amount of orthogonal coding (col.

8, lines 5-35) and signals transmitted (fig. 1, refs. 94, 96) from the multiple antennae

(fig. 1, refs. 116, 118) based upon the plurality of orthogonal codes and the at least one

autocorrelation (fig. 5). Harrison does not explicitly disclose that the plurality of codes is

orthogonal although orthogonal transmit diversity is utilized (col. 1, lines 45-57; col. 8, lines 4-12). However, Alamouti teaches the generation of an orthogonal code matrix for transmission of data over two or more antennas (abstract). An orthogonal code matrix is disclosed in table 1 as the outputs of antenna 1 and 2 over the time periods t and t+T (col. 4, line 20) which creates an output to the antennas which is a symbol and the complex conjugate of the symbol (period t vs. t+T). Alamouti discloses that the use of orthogonal coding results in space, time and frequency diversity (col. 2, lines 50-55). Therefore, it would have been obvious to one having ordinary skill in the art at the time which the invention was made to generate an orthogonal code matrix with orthogonal symbols as the plurality of codes of Harrison as taught by Alamouti because it would allow for space, time and frequency diversity.

Regarding claim 30, Harrison in view of Alamouti disclose the limitations of claim 29 as applied above. Further, using the encoding method of Alamouti, the method of Harrison in view of Alamouti comprises determining a code matrix wherein each column of the code matrix is associated with one of the plurality of orthogonal codes such that the columns are orthogonal to each other (Alamouti; col. 4, line 20, periods t vs. t+T).

Regarding claim 31, Harrison in view of Alamouti disclose the limitations of claim 29 as applied above. Further, in the method of Harrison in view of Alamouti, the forward and reverse link is the same over the air channel. Therefore, the channel estimation (col. 8, lines 32-35) disclosed by Harrison is the same for both the forward and reverse links.

Regarding claim 35, Harrison in view of Alamouti disclose the limitations of claim

29 as applied above. Further, Harrison discloses encoding at least one symbol using

the determined about of beamforming and orthogonal coding (col. 8, lines 5-35).

Regarding claim 36, Harrison in view of Alamouti disclose the limitations of claim

35 as applied above. Further, Harrison discloses transmitting the at least one encoded

symbol using the determined amount of beamforming and orthogonal coding (fig. 1,

refs. 116 and 118).

11.   Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Harrison

in view of Dabak et al (US 6594473 – previously cited; hereafter "Dabak").

Regarding claim 10, Harrison discloses the limitations of claim 9 as applied

above. Harrison discloses beamforming weight codes W0 and W1 being applied to the

information symbols, but does not disclose that they are complex representing a

magnitude and a phase. However, Dabak discloses a multiple antenna transmission

method by figure 4 which uses complex beamforming weight parameters having

magnitude and phase (fig. 4, refs. W1 and W2). The beamforming weight parameters

are utilized by the closed loop communications system to advantageously modify the

beam outputs form the transmitter (col. 3, lines 10-23; col. 4, lines 5-10; col. 4, lines 45-

50; col. 5, lines 5-30). Dabak discloses the method of generating the values of the

weights and it is obvious that the weights have a complex value due to the complex

notation of the equations used (col. 10, line 12 – col. 12, line 25). Therefore, it would

have been obvious to one having ordinary skill in the art at the time which the invention

was made to utilize complex adaptive beamforming weight parameters according to the

closed loop response of the communications method as taught by Dabak in the communications method of Harrison because it could be responsive to feedback information and adjust the beamform transmission accordingly. It is well known in the art that a complex number represents one having magnitude and phase.

12.   Claim 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over Harrison in view of Alamouti, and in further view of Rice (US 2002/0172260).

Regarding claim 34, Harrison in view of Rice disclose the limitations of claim 29 as applied above. Harrison discloses that the amount of beamforming with respect to orthogonal coding is dependent upon the channel estimation feedback, but does not explicitly disclose that the feedback is used to effect a lookup table to determine the value of α which determine the amount of beamforming relative to orthogonal coding (col. 8, lines 5-35). However, the use of lookup tables is notoriously known in the art and Rice teaches the use of a lookup table for the selection of a symbol (para. 0079). Rice teaches that the use of a lookup table is preferable because it requires a minimal amount of hardware. Therefore, it would have been obvious to one having ordinary skill in the art to utilize a lookup table as taught by Rice in the method of Harrison in view of Rice because it could advantageously be used to minimize hardware requirements.

Allowable Subject Matter

13.   Claims 11-13, 16-19, 21-28, 32, and 33 are objected to as being dependent upon a rejected base claim and/or for the claim objections set forth above, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims and/or rewritten to overcome the claim objections.

Conclusion

14.   Applicant's amendment necessitated the new ground(s) of rejection presented in

this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37

CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE

MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later

than SIX MONTHS from the date of this final action.

15.   Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Jason M Perilla whose telephone number is (571) 272-

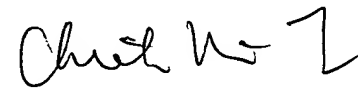3055. The examiner can normally be reached on M-F 8-5 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Stephen Chin can be reached on (571) 272-3056. The fax phone number

for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the

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Jason M. Perilla
April 12, 2005

jmp

**CHIEH M. FAN
PRIMARY EXAMINER**